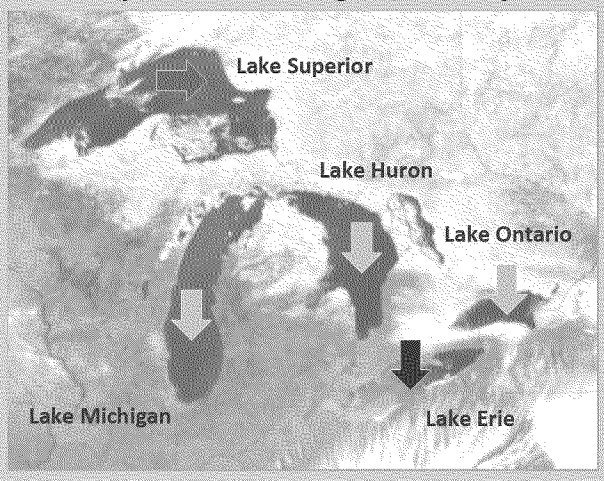
NUTRIENTS ANNEX
PROGRESS REPORT OF THE PARTIES CHAPTER

OVERVIEW

In some areas of the Great Lakes, excess phosphorus loadings threaten the Great Lakes ecosystem by contributing to harmful and nuisance algal blooms that cause drinking water impairments, exacerbate dead zones, and drive beach closures that result in loss of recreational opportunities. In response to these nutrient-induced impairments, Canada and the United States commit to coordinating binational actions to manage phosphorus loadings and concentrations in the Waters of the Great Lakes under the Nutrients Annex of the 2012 GLWQA. The Nutrients Annex requires Canada and the United States to establish phosphorus load reduction targets, allocated by country for the nearshore and open waters of Lake Erie, by 2016. Domestic Action Plans to achieve the Lake Erie targets must be developed by 2018.

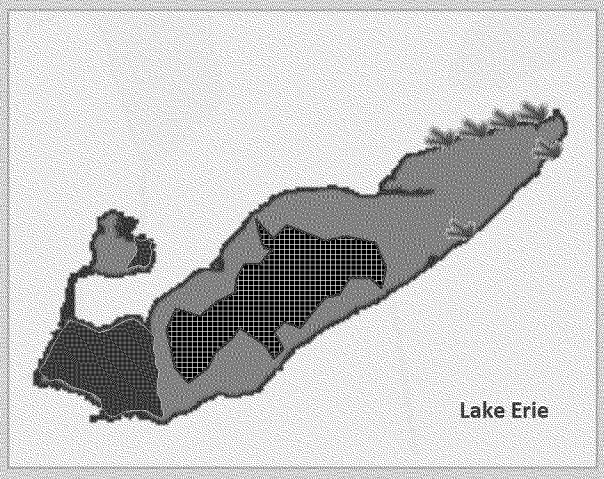
To combat the growing threat of toxic and nuisance algal development in Lake Erie, Canada and the United States adopted new phosphorus reduction targets for major tributaries and priority watersheds in the Lake Erie Bain on February 22, 2016, following a robust binational science-based process and extensive public consultation. The Parties and multiple partner agencies and are now working to develop Domestic Action Plans to meet the 2018 deadline.

Lake Erie
Most Impacted & Our Highest Priority



State of the Great Lakes Ecosystem, 2016 Draft Assessment of Nutrient Indicators

- Good
- Fair
- Poor
- Improving Trend
- No Change in Trend
- Deteriorating Trend

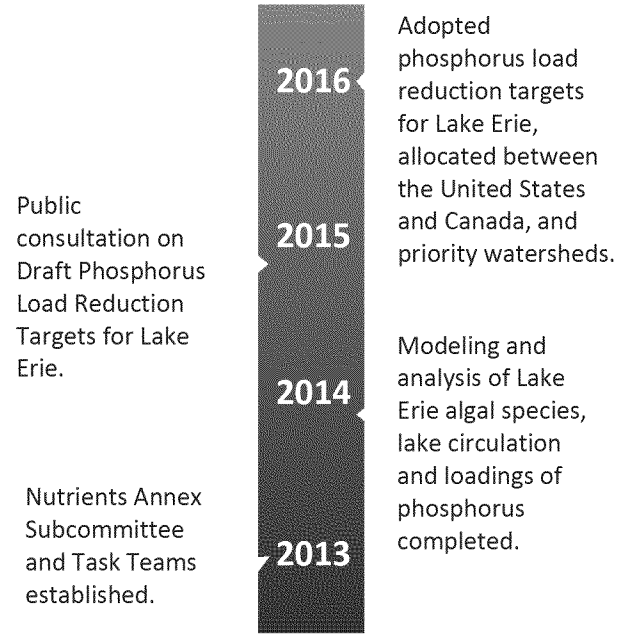


Harmful and nuisance algae:

- Cyanobacteria
- Cladophora

Seasonal hypoxia: Low oxygen conditions exacerbated by excess nutrients

PROGRESS TOWARD MEETING GLWQA COMMITMENTS



This Annex's implementation is supported by the Nutrients Annex Subcommittee, co-led by Environment and Climate Change Canada and the United States Environmental Protection Agency. Organizations on the subcommittee include:

BINATIONAL ACTIONS TAKEN FOR KEY COMMITMENTS

By 2016, develop binational substance objectives for phosphorus concentrations, loading targets, and loading allocations for Lake Erie.

- Canada and the United States adopted the following phosphorus reduction targets for Lake Erie (compared to a 2008 baseline):
  - **To minimize the extent of hypoxic zones in the waters of the central basin of Lake Erie:** a 40 percent reduction in total phosphorus entering the western and central basins of Lake Erie—from the United States and from Canada—to achieve an annual load of 6,000 metric tons to the central basin. This amounts to a reduction from the United States and Canada of 3,316 metric tons and 212 metric tons respectively.
  - **To maintain algal species consistent with healthy aquatic ecosystems in the nearshore waters of the western and central basins of Lake Erie:** a 40 percent reduction in spring total and soluble reactive phosphorus loads from the following watersheds where algae is a localized problem: in Canada, Thames River and Leamington tributaries; and in the United States, Maumee River, River Raisin, Portage River, Toussaint Creek, Sandusky River and Huron River (Ohio).
  - **To maintain cyanobacteria biomass at levels that do not produce concentrations of toxins that**

pose a threat to human or ecosystem health in the waters of the western basin of Lake Erie: a 40 percent reduction in spring total and soluble reactive phosphorus loads from the Maumee River in the United States.

- Further science and analysis is needed to establish targets that will minimize impacts from nuisance algae in the eastern basin of Lake Erie.

By 2018, develop binational phosphorus reduction strategies and domestic action plans to meet the objectives for phosphorus concentrations and loading targets in Lake Erie.

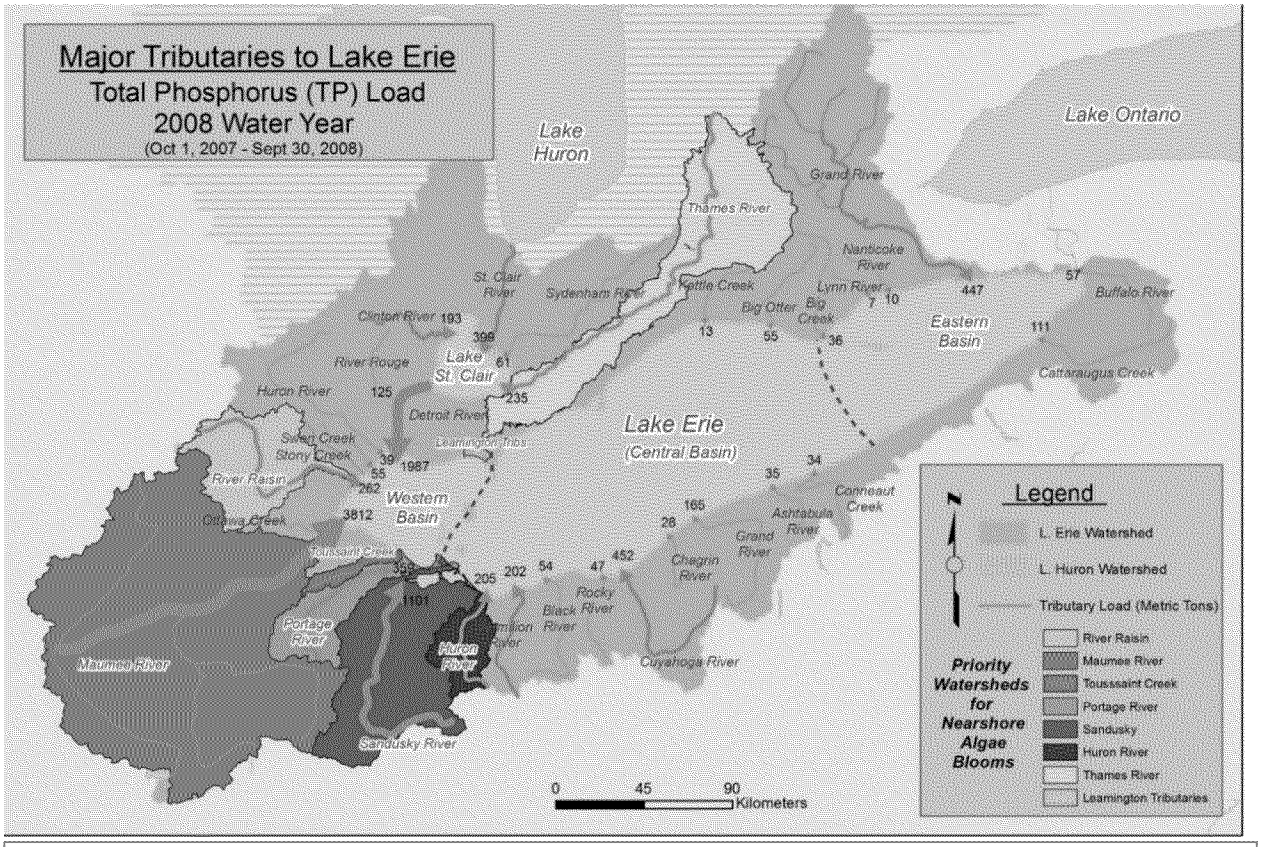
- Canada and the United States are working with multiple partner agencies, Tribes, First Nations, Métis, and stakeholders to develop a binational phosphorous reduction strategy and Domestic Action Plans. These plans will identify the actions required to meet the agreed to load reduction targets. Stakeholders are being engaged during the development process, and the draft plans will be available for further consultation in 2017.

Assess, develop, and implement programs to reduce phosphorus loadings from urban, rural, industrial and agricultural sources. This will include proven best management practices, along with new approaches and technologies.

- Ongoing efforts to limit excess phosphorus loading to the Great Lakes – through detergent bans, optimizing sewage treatment, and implementing best management practices on agricultural lands – must continue and be enhanced with better targeting and adoption. Work is underway to evaluate the existing programs in Canada and the United States, identify opportunities to maximize our phosphorus reduction efforts, and propose new programs or approaches to manage phosphorus loadings from municipal and agricultural point and nonpoint sources.

Identify priority watersheds that contribute significantly to local algae development, and develop and implement management plans to achieve phosphorus load reduction targets and controls.

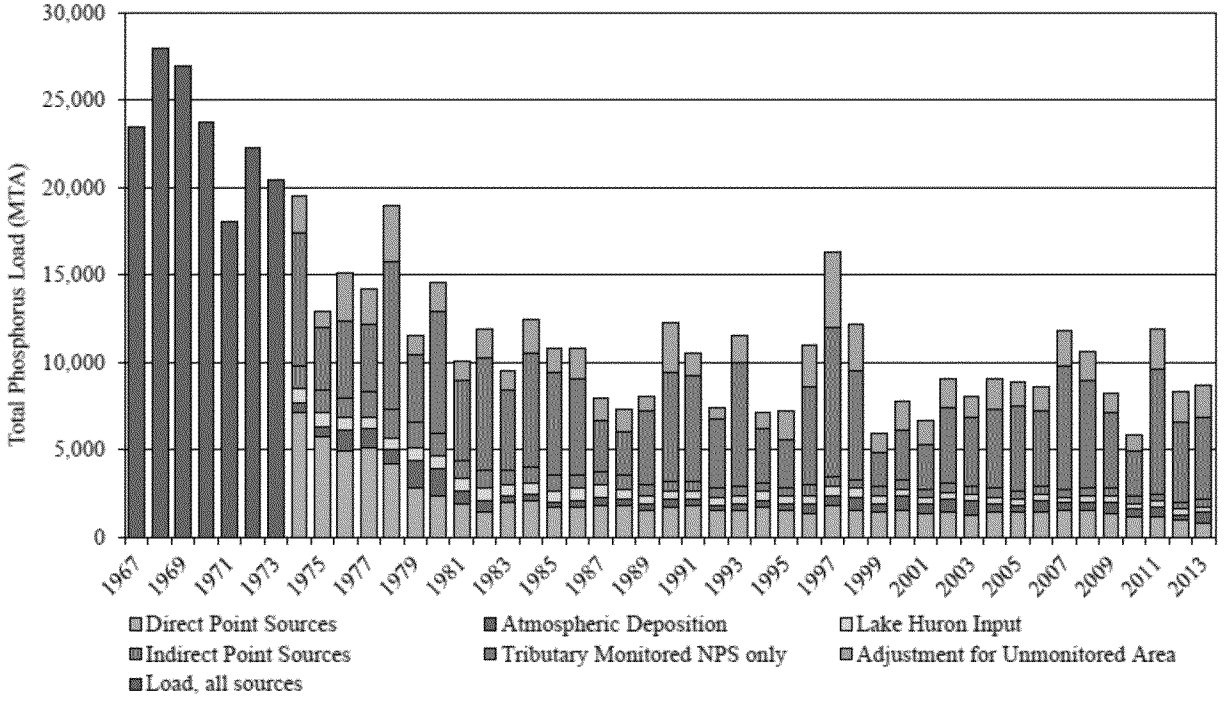
- Canada and the United States identified eight priority watersheds – two in Canada and six in the United States – for phosphorus control to address algal blooms occurring in the nearshore waters of Lake Erie [reference figure].



2008 Baseline Phosphorus loads for major tributaries to Lake Erie and the priority watersheds for nearshore blooms. Domestic action plans will further prioritize watershed implementation efforts to meet the new phosphorus load reduction goals.

Undertake and share research, monitoring and modeling necessary to establish, report on and assess the management of phosphorus and other nutrients and improve the understanding of relevant issues associated with nutrients and excessive algal blooms.

- Canada and the United States engaged several scientific experts in the development of the new phosphorus loading targets for Lake Erie, and are currently developing an approach to monitoring and tracking progress towards the new targets. The following priorities for research, monitoring and modeling have been identified:
  - Monitoring of Total Phosphorus and Dissolved Reactive Phosphorus loads and HAB and hypoxia extent and duration to evaluate effectiveness of load reduction efforts and the Lake's response over time;
  - Research on factors that contribute to Harmful Algal Bloom toxin production;
  - Better understanding of internal Phosphorus loads;
  - Factors controlling the growth of the nuisance alga *Cladophora*; and
  - Improvement of ecosystem models to understand the relationship between external, internal Phosphorus loads and algal blooms.



Total phosphorus loads to Lake Erie by source type, 1967 – 2013.

- As shown in the above chart [reference figure], under the previous 1987 GLWQA targets, Canada and the United States tracked phosphorus loads and sources on a whole-lake basis. The new targets for Lake Erie are refined to specific locations, forms of phosphorus, and time of year. Going forward, tracking and assessments related to these new targets will need refinement and appropriate data collection will be critical to the evaluation of implementation efforts and the Lake's response over time.

DOMESTIC ACTIONS TAKEN

CANADA

- In Canada, actions are being taken to manage phosphorus loads to Lake Erie through urban and rural point and non-point initiatives including ongoing infrastructure and agricultural stewardship programs. To further improve the effectiveness of current and future phosphorus management in Lake Erie, Canada and Ontario, along with their partners and stakeholders are working to review and where necessary implement changes to the existing program, policy and legislative phosphorus management frameworks. Canada's 2016 Federal Budget allocated $3.1 million in 2016 to 2017 to Environment and Climate Change Canada to continue to improve nearshore water and ecosystem

health by reducing phosphorus and the resulting algae in Lake Erie. With these resources, the focus will shift from setting phosphorus targets to achieving them, including developing a domestic action plan, and monitoring and reporting on progress. The governments of Ontario and Canada, through the Great Lakes Agricultural Stewardship Initiative (http://www.ontariosoilcrop.org/oscia-programs/glasi/), are supporting farmers in the Lake Erie and Lake St. Clair watersheds, and in Lake Huron's southeast shores watershed, implement Better Management Practices that reduce phosphorus loading to the Great Lakes.

- The United States has several permitting and funding programs to reduce phosphorus loadings from municipal, industrial and agricultural sources. For example, state environmental and agricultural programs establish discharge limits and comprehensive nutrient management plans to manage nutrient pollution. Since 2008, $314 million in Farm Bill funding has supported conservation activities on 2.5 million acres of private land throughout the Great Lakes region. Since FY 2010, over 410 nutrient reduction projects have been implemented in the Maumee River watershed with Great Lakes Restoration Initiative (GLRI) and U.S. Environmental Protection Agency Nonpoint Source Program funds. A new United States Department of Agriculture Natural Resources Conservation Service initiative launched in 2016 will help landowners reduce phosphorus runoff from farms by more than 640,000 pounds each year by effectively doubling the acres under conservation in the Western basin over the course of the three-year investment.

- Through the GLRI, federal agencies and their partners are reducing nutrient loads into the Great Lakes. During FY 2015, federal agencies and their partners funded nutrient and sediment reduction projects on over 100,000 acres of targeted watershed in the Great Lakes Basin using GLRI funding which are projected to prevent over 160,000 pounds of phosphorus from entering the Great Lakes annually. During FY 2015, federal agencies and their partners also funded urban runoff projects that are anticipated to capture an average annual volume of more than 37 million gallons of untreated urban runoff per year. These projects reduce flooding, increase green space in urban areas, and return vacant properties to productive use.

- The U.S. Geological Survey has installed ## GLRI-funded edge-of-field monitoring stations on farms in the Maumee River basin, the Fox River basin, the Saginaw River basin and the Genesee River basin. These stations will gather weather data and sample runoff water during storm events. The water samples will be analyzed for their phosphorus, nitrogen, and sediment content. USDA-Natural Resources Conservation Service (NRCS) staff will assist the cooperating farmer with installing conservation practices in the field above the stations. This analysis will help quantify the value of conservation practices in reducing sediment and nutrient delivery from these fields, under these conditions, in order to improve water quality.

- The GLRI is also funding the implementation of conservation practices including cover crops, silage leachate containment areas, a waste storage structure, and nutrient management on conservation demonstration farms in the Fox River basin. The farms are open for annual tours where other farmers in the watershed can view the installed practices, hear farmers' opinions on the value that conservation farming practices can add to their farming operations, and ask questions.

- GLRI-funded research led by the National Oceanic and Atmospheric Administration's Great Lakes Environmental Research Laboratory (NOAA GLERL), in collaboration with partners from the University of Michigan's Cooperative Institute for Limnology and Ecosystems Research, is investigating impact of land use changes and algal bloom development in the western basin of Lake Erie and in Lake Huron's Saginaw Bay. Measurements of total phosphorus, total dissolved phosphorus, and soluble reactive phosphorus will contribute to the GLRI's goal of reducing algal bloom growth through reductions in phosphorus. NOAA GLERL combines remote sensing, monitoring, and modeling to produce weekly forecasts of *Microcystin* bloom transport and concentration in Lake Erie, which are distributed to regional stakeholders. NOAA researchers, with their partners at Heidelberg University, have also initiated early season projections of the seasonal harmful algal bloom severity in western Lake Erie.

- During FY 2015, GLRI partners established a network of four real-time continuous observing buoys to track detailed water quality conditions to support modeling, forecasting, and public warnings of (HAB) conditions throughout western Lake Erie. The observing buoys are capable of tracking water quality and bloom conditions and measuring dissolved phosphorus concentrations at hourly intervals. During the 2015 bloom season, these buoys collected over 7,000 in-lake nutrient and water quality measurements, providing unprecedented spatial and temporal details of internal lake dynamics and bloom development. In addition to providing real-time tracking of HABs conditions for water intake managers and recreational users, the observing data will be used to improve ongoing forecasting efforts covering a range of spatial and temporal scales including seasonal HABs forecasts, 5-day forecasts, and vertical distribution forecasts.

- Michigan has finalized its 2016 Implementation Plan, which is the first step in achieving a 40% phosphorus reduction by 2025, for the Western Lake Erie Basin Collaborative (http://glc.org/projects/water-quality/lent/). The 2016 Implementation Plan can be found at Michigan's Department of Environmental Quality's Water Resources Division (http://www.michigan.gov/documents/deq/wrd-western-lake-erie_503547_7.pdf).

- Also in support of the Western Lake Erie Basin Collaborative, Ohio has released its draft Western Lake Erie Basin Collaborative Implementation Plan to reduce phosphorus entering Lake Erie by 40 percent by 2025. The plan was developed with input from various stakeholder groups and state agencies and is available at epa.ohio.gov/Portals/33/documents/WLEBCollaborative.pdf. Public comments are requested by June 25, 2016.

- Ohio is aggressively taking a multi-faceted, multi-year approach to reduce the discharges and runoff of nutrients to address harmful algal blooms to the Great Lakes. A summary of these Nutrient Management Initiatives can be found at Ohio Environmental Protection Agency (http://www.epa.ohio.gov/Portals/35/wqs/NutrientMangementInitiaitives.pdf).

- Indiana is working with landowners in the communities to help improve the water quality of our streams and inland rivers, and ultimately Lake Erie. A summary of the Indiana Western Lake Erie

Basin Initiatives can be found at the Indiana State Department of Agriculture (http://www.in.gov/isda/3261.htm).

- Add PA update?

- Mention Harmful Algal Bloom and Hypoxia Research and Control Act?

- Mention all the work that EPA is doing nationally to address HAB impacts by issuing guidance under the Safe Drinking Water Act? Such as:

    - Health Advisories and Health Effect Support Documents for Cyanotoxins
    - EPA Recommendations for Management of Cyanotoxins in Public Water Systems
    - Algal Toxin Risk Assessment and Management Strategic Plan for Drinking Water